REMARKS

Claims 1-48 are pending. Claim 1, 5, 9, 18, 22, 25, 26, 35, 37 and 41 have been amended. Claims 47 and 48 have been added. One paragraph of the specification has been amended.

Attached is a marked-up version of the changes being made by the current amendment.

In view of the amendments above and the remarks below, Applicants request that all claims be allowed. Applicants Remarks, below, are preceded by quotations of the related comments of the Examiner, in small, bold face type.

> **1. Claims 1-46 are rejected under 35 U. S. C. 112, second paragraph, as being indefinite for falling to particularly point out and distinctly claim the subject matter which applicant regards as his invention.**
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> **Claims 1, 9, 22, 35 and 41 are vague, indefinite and fail to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The above mentioned claims list a plurality of optical elements without any correlation or nexus between the elements so as to present a complete operative device.**

Claim 1 has been amended to clarify the connection between the elements. In particular, claim 1 provides that the correction element is "disposed along the path." Support for this amendment is found in the specification where it is stated that, "Correction element 212 is disposed in path 204 . . . . " Page 8 lines 2-4 and in FIG. 2. No new matter has been added.

Claim 9 has been amended to clarify the connection between the elements. In particular, claim 9 provides that the specified elements are disposed along the path. Support for this amendment is found in the specification at page 6 line 7 through page 8 line 5. No new matter has been added.

Claim 22 has been amended to clarify the connection between the elements. In particular, claim 22 provides that the specified elements are disposed along the path. Support for this amendment is found in the specification at page 6 line 7 through page 8 line 5. No new matter has been added.

Claim 35 is a method claim not having elements requiring a structural nexus. However, Applicants recognize the Examiner's concerns and have amended claim 35 to provide antecedent basis for the "substantially parallel

paths." Claim 35 has been further clarified and broadened by eliminating unnecessary language, "at least one o-ray and said at least one e-ray exiting said second polarizer" following "substantially parallel paths." Claim 35 was also amended to language characterizing the purpose of the correction element. Support for this amendment is found in the specification at page 8 lines 10-18. No new matter has been added.

Claim 41 has been amended to clarify the connection between the elements. In particular, claim 41 provides that the specified elements are disposed along the path. Support for this amendment is found in the specification at page 6 line 7 through page 8 line 5. No new matter has been added.

Applicants submit that their amendment and remarks overcome this rejection and request that this rejection be withdrawn.

In claim 1, lines 7-8, the use of the language "a wedge... polarizer" is vague and indefinite due to the fact the claim fails to properly define the first polarizer includes a wedge cutting angle.

Claim 1 has been amended to clarify that the first polarizer has a wedge shape. The second polarizer has also been described as wedge shaped. Applicants have broadened claim 1 by eliminating the restriction that the wedge angles of both polarizers be substantially equal. Support is found in the specification at page 6, lines 7-14 and in Fig. 2 where the wedge angle of the first polarizer is illustrated as θ_1 and the wedge angle of the second polarizer is illustrated as θ_2. No new matter has been added.

Applicants submit that their amendment and remarks overcome this rejection and request that this rejection be withdrawn.

In claim 1, line 10, the use of the language "said optic axis angle" is vague, indefinite and/or confusing. It would appear that the above mentioned language lacks proper antecedent basis. Moreover, it is unclear whether applicant is referring to the optic axis of the second polarizer or the correction element.

Claim 1 has been amended to provide proper antecedent basis for "said optic axis angle" by adding the inadvertently omitted word "angle" after "optic axis" in line 10. Support for this amendment is found in the specification at page 8 lines 10-17. No new matter has been added.

Applicants submit that their amendment and remarks overcome this rejection and request that this rejection be withdrawn.

In claim 2, line 2, the use f the language "the same wedge angle" is vague and indefinite for the same reason stated above.

This rejection is overcome by the amendments to claim 1 described above.

Applicants submit that their amendment and remarks overcome this rejection and request that this rejection be withdrawn.

In claims 35 and 41, the use of the language "said substantially parallel" is vague, indefinite and lacks proper antecedent basis. Moreover, the use of the above mentioned language in connection with the language "at least... polarizer" recited thereafter, renders that portion of the claim nonsensical.

This rejection is overcome by the amendments to claims 35 and 41 described above. Applicants have amended claims 35 and 41 to add the omitted word "paths" after "substantially parallel" to provide proper antecedent basis. Applicants have broadened the claims by removing the unnecessary language "at least . . . polarizer."

Applicants submit that their amendment and remarks overcome this rejection and request that this rejection be withdrawn.

In claims 37 and 43, line 2, the use of the language "namely DGD" is vague and indefinite.

3. A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim)is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989) as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a)merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, claims 37 and 43 recite the broad recitation polarization mode dispersion, and the claim also recites DGD which is the narrower statement of the range/limitation.

Claims 37 and 43 have been amended to broaden the claims by eliminating the phrase "namely DGD." Support for this change is found in the specification at page 11 lines 3-5.

Applicants submit that their amendment and remarks overcome this rejection and request that this rejection be withdrawn.

4. The following is a quotation of the appropriate paragraphs of 35 U. S. C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless (b)the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 9-12, 20, 21, 35-37 and 41-43 are rejected under 35 U. S. C. 102(b) as being anticipated by Matsui ('245).

To the extent the claims are definite, Matsui discloses an optical isolator comprising a first polarizer (12), a polarization rotator (17) a second polarizer (13) and a correction element (16). Note figures 2 and 3 and the associated description thereof.

Applicants respectfully traverse this rejection. The polarizer disclosed in Matsui ('245) is a crystal plate. See, for example, the "Purpose" of the English language summary provided by the Examiner.

In contrast, the present application discloses and claims polarizers that are wedge shaped. Amended claim 9 recites "a first polarizer that is wedge shaped . . . a second polarizer that is wedge shaped . . . ." Amended claims 35 and 41 recite that the correction element has "an optic axis angle . . . and a length chosen to compensate for differential group delay and walk-off introduced by the separating and the refracting." This characteristic is not suggested by Matsui. Claims 10-12, 20, 21, 36, 37, 42, and 43 are dependent from at least one of allowable claims 9, 35 and 41 and should be allowable for at least the same reasons.

Applicants submit that their amendment and remarks overcome this rejection and request that this rejection be withdrawn.

6. Claims 9-12, 15-25 and 27-46 are rejected under 35 U. S. C. 102(b)as being anticipated by Konno et al ('264).

To the extent the claims are definite, Konno et al discloses an optical isolator comprising a first polarizer (P11), a polarization rotator (Fl), a second polarizer (P12)and a correction element (P13e), or alternatively a first polarizer (P21, P21e), a polarization rotator (F), a second polarizer (P22)and a correction element (P23, P23e), wherein the walk off distance of at least one of the rays is inherently approximately equal to the length of the correction element multiplied by the tangent of an angle (B) due to the fact that the rays are synthesized at the exit end of the correction element. Note figures 1A, lB, 7A and 7B and the associated description thereof.

Applicants respectfully traverse this rejection. Konno ('264) discloses the use of a combination of birefringent crystalline plates. The polarizers disclosed in Konno are crystalline plates. Col. 6 lines 12-21, col 3 lines 28-32 and in Figs 1A, 1B, 2-4, 7A and 7B.

In contrast, the present application discloses and claims a polarizer that is wedge shaped. See amended claim 9 and 22. Amended claims 35 and 41 recite that the correction element has "an optic axis angle . . . and a length chosen to compensate for

differential group delay and walk-off introduced by the separating and the refracting." This characteristic is not suggested by Konno. Claims 10,11, 15-21, 23-25, 27-40 and 42-46 are dependent from at least one of allowable claims 9, 22, 35 and 41 and should be allowable for at least the same reasons.

Applicants submit that their amendment and remarks overcome this rejection and request that this rejection be withdrawn.

7. Claims 9-26 and 28-46 are rejected under 35 U. S. C. 102(b) as being anticipated by Nakamura ('892).

To the extent the claims are definite, Nakamura discloses an optical isolator comprising a first polarizer (l), a polarization rotator (4 or 5) a second polarizer (2) and a correction element (3), or alternatively a first polarizer (1l), a polarization rotator (14), a second polarizer (12)and a correction element (33) wherein the walk off distance of at least one of the rays is inherently approximately equal to the length of the correction element multiplied by the tangent of an angle (B) due to the fact that the rays are synthesized at the exit end of the correction element. Note figures 1 to 5 and the associated description thereof.

Applicants respectfully traverse this rejection. Nakamura ('892) discloses an optical isolator comprising birefringent crystals 1, 2 and 3 having flat plate shapes. Col. 2 lines 23-28.

In contrast, the present application discloses and claims a polarizer that is wedge shaped. See amended claims 9 and 22. Amended claims 35 and 41 recite that the correction element has "an optic axis angle . . . and a length chosen to compensate for differential group delay and walk-off introduced by the separating and the refracting." This characteristic is not suggested by Nakamura. . Claims 10-21, 23-26, 28-40 and 42-46 are dependent from at least one of allowable claims 9, 22, 35 and 41 and should be allowable for at least the same reasons.

Applicants submit that their amendment and remarks overcome this rejection and request that this rejection be withdrawn.

8. Claims 9-26 and 28-46 are rejected under 35 U. S. C. 102(b) as being anticipated by MacArthur ('058).

To the extent the claims are definite, MacArthur discloses an optical isolator comprising a first polarizer (21)a polarization rotator (27), a second polarizer (23) and a correction element (42), wherein the walk off distance of at least one of the rays is inherently approximately equal to the: length of the correction element multiplied by the tangent of an angle (B) due to the fact that the rays are synthesized at the exit end of the correction element. Note figures 1 to 9 and the associated description thereof.

Applicants respectfully traverse this rejection. MacArthur ('058) discloses a beam-splitter as part of a multiple beam exposure control comprising optical polarizers

having plate shapes. See, e.g., Figs. 1-4. MacArthur does not teach or suggest that the polarizers are wedge shaped.

In contrast, the present application discloses and claims a polarizer that is wedge shaped. See amended claims 9 and 22. Amended claims 35 and 41 recite that the correction element has "an optic axis angle . . . and a length chosen to compensate for differential group delay and walk-off introduced by the separating and the refracting." This characteristic is not suggested by MacArthur. Claims 10-21, 23-26, 28-34, 36-40 and 42-46 are dependent from at least one of allowable claims 9, 22, 35 and 41 and should be allowable for at least the same reasons.

Applicants submit that their amendment and remarks overcome this rejection and request that this rejection be withdrawn.

9. Claims 9-46 are rejected under 35 U. S. C. 102(b) as being anticipated by Matsumato et al (' 329).

To the extent the claims are definite, Matsumato et al discloses an optical isolator comprising a first polarizer (4), a polarization rotator (6), a second polarizer (5) and a correction element (7) or alternately a first polarizer (4)a polarization rotator (6), a second polarizer (8) and a correction element (5) wherein the walk off distance of at least one of the rays is inherently approximately equal to the length of the correction element multiplied by the tangent of an angle (B)due to the fact that the rays are synthesized at the exit end of the correction element. Note figures 1A to 6 and the associated description thereof.

Applicants respectfully traverse this rejection. Matsumato et al. ('329) discloses a lens (3) and two birefringent crystal plates (4) and (5) disposed in an optical path. Col. 3 lines 34-36 and in Fig. 1.

In contrast, the present application discloses and claims a polarizer that is wedge shaped. See amended claims 9 and 22. Amended claims 35 and 41 recite that the correction element has "an optic axis angle . . . and a length chosen to compensate for differential group delay and walk-off introduced by the separating and the refracting." This characteristic is not suggested by Matsmato. Claims 10-21, 23-26, 28-34, 35-40 and 42-46 are dependent from at least one of allowable claims 9, 22, 35 and 41 and should be allowable for at least the same reasons.

Applicants submit that their amendment and remarks overcome this rejection and request that this rejection be withdrawn.

10. Claims l-46 are rejected under 35 U. S. C. 102(b) as being anticipated by Swan ('771).

To the extent the claims are definite, Swan discloses an optical isolat r comprising a first p larizer (14), a polarization rotator (12), a second polarizer (16) and a correction element (22) wherein the walk off distance of at least one of the rays is inherently approximately equal t the length f the correction element multiplied by the tangent f an

angle (B) due t the fact that the rays are synthesized at the exit end f the correction element. N te figures 1 to 3 and the associated description there f.

Applicants respectfully traverse this rejection. Swan ('771) discloses a pair of birefringent wedges (14, 16) with their optical axes oriented at 45 degrees to one another. In particular, Swan discloses that the optical axis of a birefringent wedge (14) is oriented at an angle of 22.5 degrees with respect to an edge (19) of a beveled surface (18). Similarly, the birefringent wedge (16) has an optical axis oriented at an angle of –22.5 degrees with respect to an edge (21) of a beveled surface (20). Col. 6, lines 21-32 and in Fig. 1.

In contrast, the present application discloses and claims a birefringent wedge having an optical axis oriented at an angle of ±45 degrees and 0/90 degrees "relative to a vertical edge of the . . . polarizer." See amended claims 25 and 26 and at page 7, lines 16-19.

Swan ('771) further discloses a compensating plate (22) having an optical axis oriented with respect to the birefringent wedge (16). In particular, the plate (22) has its optical axis at an angle of –22.5 degrees with respect to an plate edge (25) of a plate front face (24). Col. 7, lines 6-20 and in Fig. 1. Thus, the optical axis is in a plane which is tilted at an angle with respect to the normal front face 24.

The present application discloses and claims the optical axis of the compensating plate oriented at an angle with respect to a surface normal to the front face. The optical axis is in a plane that is defined by the ordinary-ray and the extraordinary-ray. See, e.g., amended claim 9 which claims that "the optic axis . . . lies in a plane defined by the . . . o-ray and . . . e-ray" and also in the specification at page 8 line 18 – page 9 line 3.

Applicants submit that their amendment and remarks overcome this rejection and request that this rejection be withdrawn.

11. The disclosure is objected to because of the following informalities: elements 114 and 116, shown in Fig. 1, each lack a proper written description.
Appropriate correction is required.

The specification has been amended to add the elements 114 and 116. These are an ordinary-ray and an extraordinary-ray, respectively. Both rays are described in the specification at page 2 lines 13-16. No new matter has been added.

Applicants assert that their amendment and remarks overcome this objection and request that this objection be removed.

Claim 5 has been amended to clarify that the angle is the optic axis angle of the

correction element. The basis for the claim is found in the specification at page 9 line 5-9. No new matter has been added.

Claim 18 was amended to correct the dependency to claim 17.

Claims 25 and 26 were amended to clarify that the optic axis is relative to a vertical edge of the second polarizer. Support for this amendment is found in the specification at page 7, lines 16-19 where the vertical edge is normal to the path.

Applicant asks that all claims be allowed. Enclosed is a $36 check for excess claim fees. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

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Version with markings to show changes made

In the specification:

Paragraph beginning at page 2, line 9 has been amended as follows:

Figure 1 shows a prior art optical isolator as described in U.S. Patent No. 4,548,478 and assigned to Fujitsu Limited of Kawasaki of Japan. The optical isolator 100 of FIG. 1 includes an optical fiber 102 from which an incident light beam 104 is launched into a first lens 106. Two birefringent plates 108 and 112 are placed on either side of a 45° Faraday rotator 110 within the path of the light beam 104. When light passes through the birefringent plate 108 in a forward direction (left to right), the angle of refraction of an ordinary-ray (o-ray) 114 and an extraordinary-ray (e-ray) 116 are different, so that a polarization separation is realized. the o- and e-rays are then directed into the Faraday rotator 110, where their planes of polarization are rotated 45°. The o- and e-rays are then directed into birefringent plate 112, which is configured to transmit the e- and o-rays in a parallel manner. These parallel beams are then focused into optical fiber 120 by second lens 118. However, light traveling in a reverse direction (from right to left) will have its e- and o-rays refracted in a different manner by the birefringent plates, causing the rays not to be focused into optical fiber 102 by lens 104.

In the claims:

Claim 1, 5, 9, 18, 22, 25, 26, 35, 37, 41 and 43 have been amended as follows:

1. (Amended) An optical isolator core comprising:

A first polarizer having a wedge shape and configured to receive incident light traveling along a path and refract [said] the incident light into o-rays and e-rays;

a rotator disposed along [said] the path and configured to rotate [said] the polarization planes of [said] the o-rays and e-rays;

a second polarizer having a wedge shape and disposed along [said] the path and having an optic axis approximately 45° apart from an optical axis of the [said] first polarizer [and having a wedge cutting angle substantially same as said first polarizer]; and

a correction element of birefringent material, disposed along the path, having a length and an optic axis angle [having a cutting angle], wherein [said] the length and [said] the correction element optic axis angle are chosen to compensate for differential group delay and walk-off introduced by [said] the first and [said] the second polarizers.

5. (Amended) The optical isolator of claim 1, wherein a distance traveled by said o-rays and said e-rays through [said] the correction element is equal to [said] the length of the correction element multiplied by the tangent of [said predetermined] angle β

9. (Amended) An optical isolator adapted for receiving light transmitted through the isolator in a forward direction comprising:

a first polarizer having a wedge shape, disposed along a path, configured to separate light incident in the forward direction into at least one o-ray and at least one e-ray;

a polarization rotator disposed along the path;

a second polarizer having a wedge shape and disposed along the path; and

a correction element, disposed along the path, having a crystal optic axis which lies in a plane defined by [said] the at least one e-ray and [said] the at least one o-ray.

18. (Amended) The optical isolator of claim [15] 17 wherein [said] the at least one o-ray and [said] the at least one e-ray exit [said] the second polarizer separated by a walk-off distance which is approximately equal to [said] the length L of the correction element multiplied by the tangent of angle β.

22. (Amended) An optical isolator adapted for receiving light transmitted through the isolator [on] in a forward direction comprising:

a first polarizer, having a wedge shape and disposed along a path, configured to separate light incident in the forward direction into at least one o-ray and at least one e-ray;

a polarization rotator disposed along the path;

a second polarizer, having a wedge shape and disposed along the path, configured to refract [at said] the at least one o-ray and at least one e-ray [exit] such that they exit said second polarizer in substantially parallel light paths separated by a walk-off distance; and

a correction element, disposed along the path, having a length and a crystal optic axis which lies in a plane defined by [said] the at least one o-ray and at least one e-ray, and wherein at least one of [said] the at least one o-ray and at least one e-ray exiting [said] the second polarizer are refracted by [said] the correction element such that their respective light paths intersect at an angle β.

25. (Amended) The optical isolator of claim 22 wherein [said] the first polarizer has a crystal optic axis angle of approximately +/-45" relative to a [beveled] vertical edge of [said] the first polarizer.

26. (Amended) The optical isolator of claim 22 wherein [said] the second polarizer has a crystal optic axis angle of approximately 0° or 90° relative to a [beveled] vertical edge of [said] the second polarizer.

35. (Amended) A method for receiving light passing through an optical isolator in a forward direction through the isolator comprising:

separating the light traveling in a forward direction into at least one o-ray and [said] at least one e-ray;

rotating the polarization of [said] the at least one o-ray and [said] the at least one e-ray;

refracting [said] the at least one o-ray and [said] the at least one e-ray such that they are in substantially parallel paths; and

passing [said] the at least one o-ray and [said] the at least one e-ray through a correction element having an optic axis, in a plane defined by [said] the substantially parallel paths, [at least one o-ray and said at least one e-ray exiting said second polarizer] and a length chosen to compensate for differential group delay and walk-off introduced by the separating and the refracting.

37. (Amended) The method of claim 35 wherein said correction element is configured to substantially eliminate the first order polarization mode dispersion[, namely DGD].

41. (Amended) An optical isolator comprising:

means for separating light traveling in a forward direction disposed along a path into at least one o-ray and [said] at least one e-ray;

means for rotating the polarization of [said] the at least one o-ray and [said] the at least one e-ray;

means for refracting [said] the at least one o-ray and [said] the at least one e-ray, disposed along the path, such that they are in substantially parallel paths; and

means for passing [said] the at least one o-ray and [said] the at least one e-ray, disposed along the path, through a correction element having an optic axis in a plane defined by [said] the substantially parallel paths [at least one o-ray and said at least one e-ray exiting said second polarizer] and a length chosen to compensate for differential group delay and walk-off introduced by the separating and the refracting.

43. (Amended) The method of claim 41 wherein said correction element is configured to substantially eliminate the first order polarization mode dispersion[, namely DGD].